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(54) Image-forming apparatus provided with a support for a roll of receiving material

(57) An image-forming apparatus comprising a process unit (1) and situated therebeneath a feed unit (2) for receiving material which can be fed selectively from rolls of receiving material (16, 17, 18, 19) rotatably placed in drawers (14, 15). A channel (35; 36, 37, 48, 49) is formed on a panelling part (33) of the feed unit (2) at working height for a standing operator, it being possible to place a roll of receiving material (16, 17, 18, 19) provided with a hollow core (30) in said channel in order to introduce a spindle (31) into the roll core (30).

After the fitting of the spindle (31), the operator can, without moving his position, place the roll of receiving material (16, 17, 18, 19) in the open drawer (14, 15) on bearing blocks disposed therein.

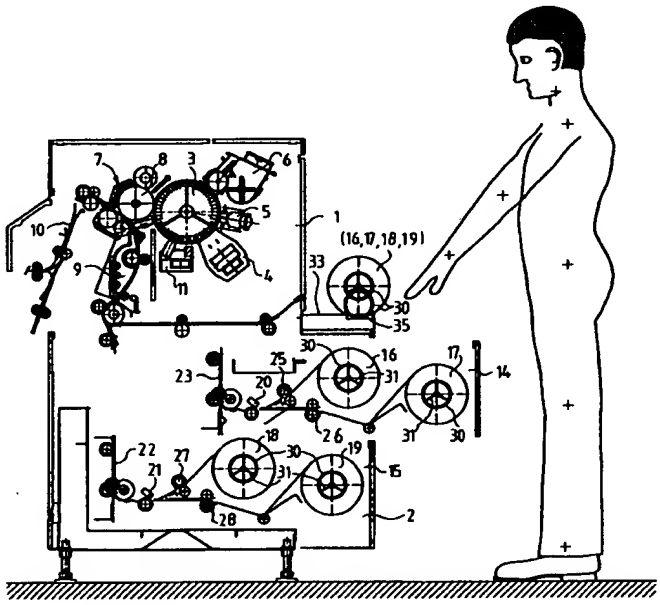

Fig. 1

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Description

The invention relates to an image-forming apparatus for forming an image on receiving material unrolled from a roll of receiving material, which roll comprises a hollow roll core in which fits a spindle which can be placed rotatably in the image-forming apparatus.

An image-forming apparatus of this kind is known from US patent 5 244 163.

For fitting and securing the spindle in the roll core it is conventional manually to hold a clamp fixed on the spindle in a position in which the spindle can slide with play into the core and, when the required position is reached, the clamp is released in order to achieve clamping. Particularly in the case of bulky and/or heavy rolls, it is difficult to perform this operation because the spindle must be longer than the widest roll. To form an image on an AO sheet, the roll must be at least 914 mm wide and the spindle with its journals about 1000 mm long. It is a complex operation to fit a spindle of this length into the core of a roll 914 mm wide and usually about 180 mm thick and hence about 16 kg in weight. It would be possible to use a separate table for this purpose, on which the roll is placed and then the spindle manoeuvred into the roll core using two hands. Apart from the table required, a disadvantage of this is that the roll can easily roll away, with all the consequences thereof, before, during or after this operation. Another disadvantage is that if the place for fitting the spindle into the roll core is chosen arbitrarily, it can readily happen that the spindle is pushed into the roll core from the wrong side and/or the assembly may be wrongly placed in the image-forming apparatus when the roll is transferred from the spindle introduction station to the roll insertion station.

The object of this invention is to provide an image-forming device which is intended to obviate these disadvantages.

In an image-forming apparatus of the type indicated in the preamble, to this end, according to the invention, one outside of the image-forming apparatus is provided with support points spaced apart in two directions extending transversely of one another, the roll of receiving material resting in stable manner on said support points during the fitting of the spindle into the core. Consequently, the roll can be kept at a fixed place during insertion of the spindle and does not need to be held fast manually during the positioning of the spindle in the roll core.

In one attractive embodiment, the support points are formed by two oblique surfaces which face one another and which together form an abutment surface both for a roll of predetermined maximum diameter for a roll and of predetermined minimum diameter. Consequently, irrespective of its diameter between the said limits, a roll of receiving material is supported flat and in stable manner and, according, there is a minimum risk of damage of the receiving material during the positioning of the spindle in the roll core.

In one advantageous embodiment of an image-forming apparatus according to the invention, the support points are disposed on a panelling part directly above the space in which the roll of receiving material can be rotatably placed. Consequently, the place for fitting the spindle in the roll core is situated at the working height of a standing operator and at a short distance from the place where the roll of receiving material can be placed in the image-forming apparatus, so that the operator does not need to move position between fitting the spindle and placing the roll in the image-forming apparatus.

Other features and advantages of the invention will be explained hereinafter with reference to the accompanying drawings wherein:

Fig. 1 is a section of an image-forming apparatus according to the invention.
Fig. 2 is a detail of the image-forming apparatus shown in Fig. 1, showing a support for a roll of receiving material during the fitting of the spindle in the roll core.
Fig. 3 is a top plan view of the detail shown in Fig. 2.
Fig. 4 is a side elevation of the spindle for fitting and
Fig. 5 is a cross-section of the spindle for fitting.

The image-forming apparatus shown in Fig. 1 comprises an electrophotographic process unit 1 and a feed unit 2 for receiving materials. The process unit 1 is formed by a rotatable photoconductive drum 3 having a working width of at least 914 mm, surrounded by a charging device 4 for charging the photoconductive drum 3, a LED array 5 for image-wise discharge of the charged drum 3, a developing device 6 for developing the remaining charge image on the drum 3 with toner, an image transfer device 7 for transferring the resulting toner image to an image transfer roller 8 and then, by heat and pressure, to a receiving material preheated by a heating device 9. The resulting copy leaves the image-forming apparatus via discharge path 10. After the image transfer the photoconductive drum 3 is regenerated for a following cycle a regenerating device 11.

The receiving material is fed to the process unit 1 from a feed unit 2 situated beneath the process unit 1. This feed unit 2 comprises two drawers 14 and 15 disposed one above the other. Each drawer 14 and 15 contains two roll holders for rotatably receiving rolls of receiving material 16 and 17; 18 and 19, respectively and a common cutting device 20; 21 respectively, for cutting off a sheet of unrolled receiving material. Each drawer 14 and 15 also contains a conveyor 22, 23 respectively extending in the vertical direction, for feeding a cut-off sheet of receiving material to the process unit 1 when the drawers are closed. In Fig. 1 the top drawer 14 is shown in a partially open position for replacement of roll 17 and the bottom drawer 15 is shown in the closed operative position.

In the closed position, transport rollers at each roll, denoted by 25, 26, 27 and 28 respectively, unwind

receiving material from the selected roll and feed it via the common conveyor 22 and/or 23 to the process unit. During this feed, the associated cutting device 20 or 21 cuts off a sheet of the required length from the continuously moving web of receiving material. Receiving material can be provided in roll form in different widths, varying from a width of 420 mm for transverse feed of an A3 format or longitudinal feed of an A2 format, a width of 600 mm for transverse feed of an A2 format and longitudinal feed of an A1 format, to a width of 914 mm for longitudinal feed of an AO format and transverse feed of an A1 format.

The maximum roll thickness may be approximately 190 mm.

The receiving material is wound around a hollow cardboard roll core 30 having an outside diameter of 86 mm. To accommodate a roll in the feed unit 2, a spindle 31 shown in Figs. 4 and 5 must be pushed into the roll core 30, said spindle 31 having journals 32 and 33 for rotatable fixing of a roll of receiving material in drawer 14 or 15.

A roll of receiving material of maximum width and maximum thickness has a weight of about 18 kg. With such a bulky and heavy roll it is not easy to insert a long spindle therein without aids, and certainly not if the roll must occupy an accurate position - which is not defined by an abutment - with respect to the spindle, this being the case, for example, with central feed of receiving material through the process unit.

On the side where the drawers 14 and 15 open, the feed unit 2 projects beyond the process unit 1 by a distance corresponding approximately to the maximum diameter that a roll of receiving material can have. Given a supply unit height of about 800 mm, a worktop 33 thus forms at a height suitable for a standing operator. This worktop 33, which is shown in detail in Fig. 2, extends over the entire width of the image-forming apparatus and is adapted to easy insertion and removal of a spindle 31 in the roll core 30 of a roll of receiving material 16, 17, 18 or 19.

For this purpose, near the edge 34 situated opposite the process unit 1, the worktop 33 is provided with a V-shaped channel 35. This channel is formed by two oblique surfaces 36 and 37 each forming an angle of 30° with the worktop 33. The distance between the oblique surfaces 36 and 37 is so selected that they can act as an abutment surface both for a roll of minimum thickness, i.e. the outside diameter (86 mm) of the roll core 30, and a roll of maximum thickness, e.g. a roll having a diameter of 186 mm.

In the case of a minimum roll diameter of 86 mm and a maximum roll diameter of 186 mm, a suitable distance between the oblique surfaces 36 and 37 at worktop height is 70 mm. To be able to push a full feed roll of 18 kg out of the channel at spindle height the minimum force required is 70/186.180 N = 6.7 N, so that stable positioning of the feed roll in the channel is guaranteed.

The shortest distance between the oblique surfaces 36 and 37 is 23 mm, sufficiently small for a roll of minimum size, i.e. the roll core with a thickness of 86 mm, which drops furthest into the channel, not to come into contact by the bottom edge against a baseplate 38 fixed as a protection against the bottom edges of the oblique plates 36 and 37. Thus a stable position of a roll in the channel 35 is obtained irrespective of the diameter of the roll within the said limits.

It will be apparent that to obtain a stable position of a roll of a specific diameter it is sufficient to have just three support points, two of which support the roll on a line situated at some distance on one side of a vertical plane through the centre of gravity and the roll axis and one of which supports the roll at some distance on the other side of said plane.

In the embodiment shown in Figs. 1 to 3, the channel 35 is formed by an H-shaped recess in the top plate 33 of the roll compartment, as will be seen in Fig. 2, and by bending down the resulting lips at an angle to form the oblique abutment surfaces 36 and 37.

To insert a spindle 31 into a roll core 30 of a roll of receiving material, the roll is placed in the channel 35, e.g. as shown in the top plan view of Fig. 3. As shown in Fig. 4, the spindle 31 is provided with journals 40 and 41 and, therebetween, three radially extending fins 42, 43 and 44, the free ends of which are situated in a cylindrical plane with a diameter somewhat smaller than the inside diameter of the roll core 30. To be able to push the spindle 31 into the roll core 30, a clamp in the middle 46 of the spindle is held to within the end of the fin 42 by means of a handle (not shown) at the end 45 of the fin 42 and the spindle 31 is pushed with the journal 41 first into the roll core on the side indicated by reference 47 in Fig. 3. On insertion and removal the spindle 31 is always held with the fin 42 in an upright position. Thus on insertion the format markings provided on the side of the fin 43 facing the operator are an aid to exactly bringing the spindle and the roll core into the required relative positions. When a spindle is pushed out of an empty roll core a straight upwardly extending fin 42 ensures that the obliquely downwardly extending fins 43 and 44 remain above the top surface 33.

In order to prevent the roll of receiving material from shifting at its ends in the channel 35 during the insertion of a spindle 31 into and its removal from a roll core 30, with the possible risk of damage, the channel 35 is provided with upright walls 48 and 49. On insertion of a spindle the roll can then be placed against wall 48 and on removal against wall 49.

When the spindle 31 has reached the required position relatively to a roll of receiving material, the handle is released, so that a clamp on fin 42 in the middle 46 presses the roll core in order to lock the spindle in the roll core axially and tangentially.

After a spindle 31 has been fitted in the roll core 30 of a roll of receiving material in the channel 35, the operator can, without changing his position, take hold of the roll on either side by placing his hands in the space between the fins 42 and 43 and the roll core and thus place the roll in the required place in the drawer 14 or 15

opened for the purpose, on bearing blocks provided for the purpose. A relatively heavy roll can most easily be placed in the top drawer directly behind the loading door because the operator can stand closest to the apparatus in these conditions (there is no need to open the drawer far) and because the operator then has the least distance to bend to introduce the roll.

Claims

1. An image-forming apparatus for forming an image on receiving material unrolled from a roll (16, 17, 18, 19) of receiving material, which roll (16, 17, 18, 19) comprises a hollow roll core (30) in which fits a spindle (31) which can be placed rotatably in the image-forming apparatus, characterised in that one outside (33) of the image-forming apparatus is provided with support points (36, 37) spaced apart in two directions extending transversely of one another, the roll (16, 17, 18, 19) resting in stable manner on said support points during the fitting of the spindle (31) into the roll core (30).

2. An image-forming apparatus according to claim 1, characterised in that the support points are formed by two oblique surfaces (36, 37) which face one another and which together form an abutment surface for the roll of receiving material.

3. An image-forming apparatus according to claim 2, characterised in that as considered in the direction of the spindle (31) the oblique surfaces (36, 37) have a size which is larger than the width of the widest roll of receiving material (16, 17, 18, 19) which can be placed in the image-forming apparatus.

4. An image-forming apparatus according to claim 3, characterised in that as considered in the direction of the spindle an upright edge (48, 49) is formed at the ends of the oblique surfaces (36, 37) to form an abutment for a roll of receiving material (16, 17, 18, 19).

5. An image-forming apparatus according to claim 2, characterised in that as considered in the peripheral direction of a roll of receiving material (16, 17, 18, 19) the oblique surfaces (36, 37) have a length such that they form an abutment surface both for a roll of receiving material having a predetermined maximum diameter and for a roll of receiving material having a predetermined minimum diameter.

6. An image-forming apparatus according to any one of the preceding claims, characterised in that the support points (36, 37) are disposed on a panelling part (33) directly above the space (14, 15) in which the roll of receiving material (16, 17, 18, 19) can be rotatably placed.

7. An image-forming apparatus according to claim 6, characterised in that the roll of receiving material (16, 17, 18, 19) is adapted to be rotatably placed in a drawer (14, 15) which in the open state offers a receiving place for a roll of receiving material (16, 17, 18, 19) situated obliquely beneath the panelling part (33) on which the support points (36, 37) are disposed.

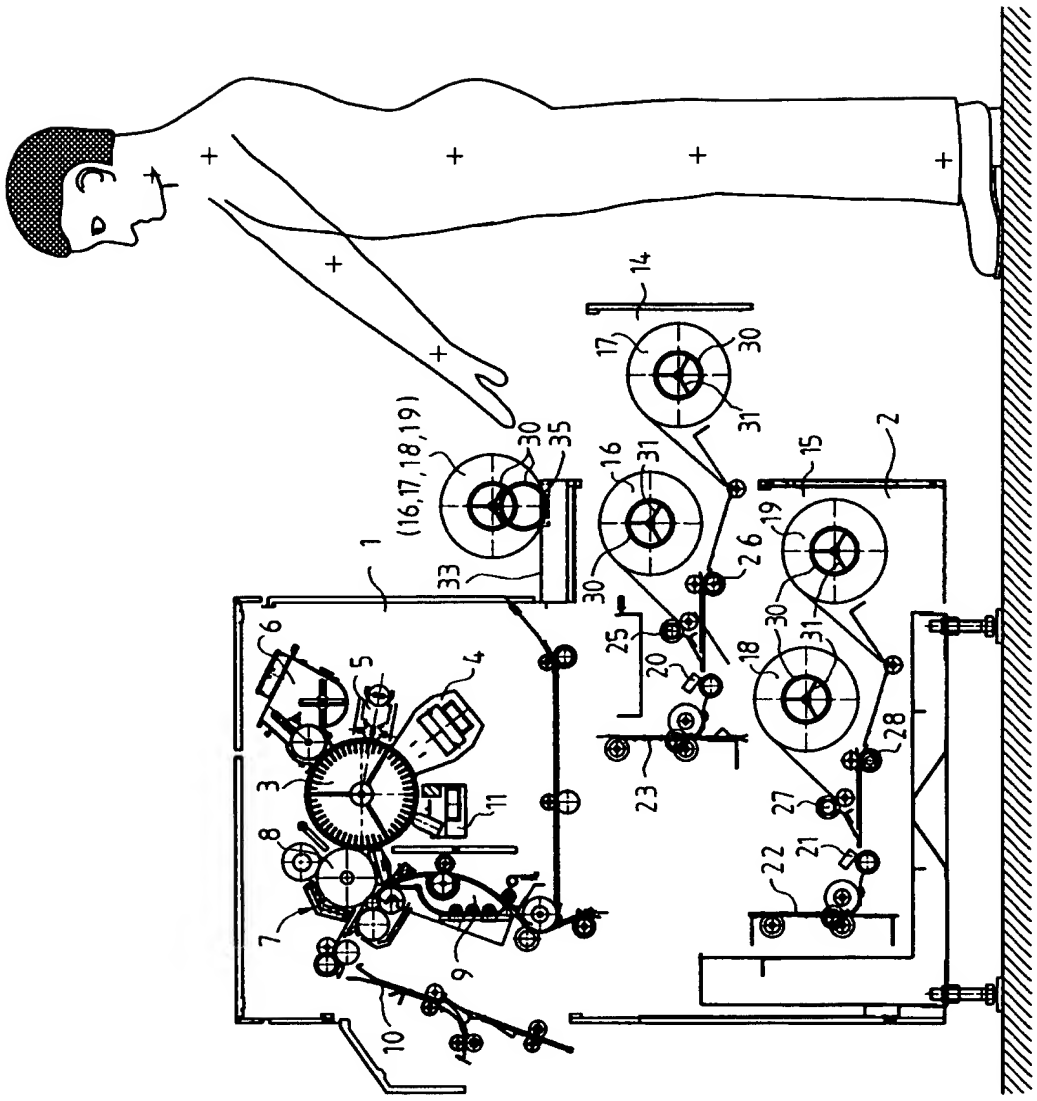
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Fig. 1

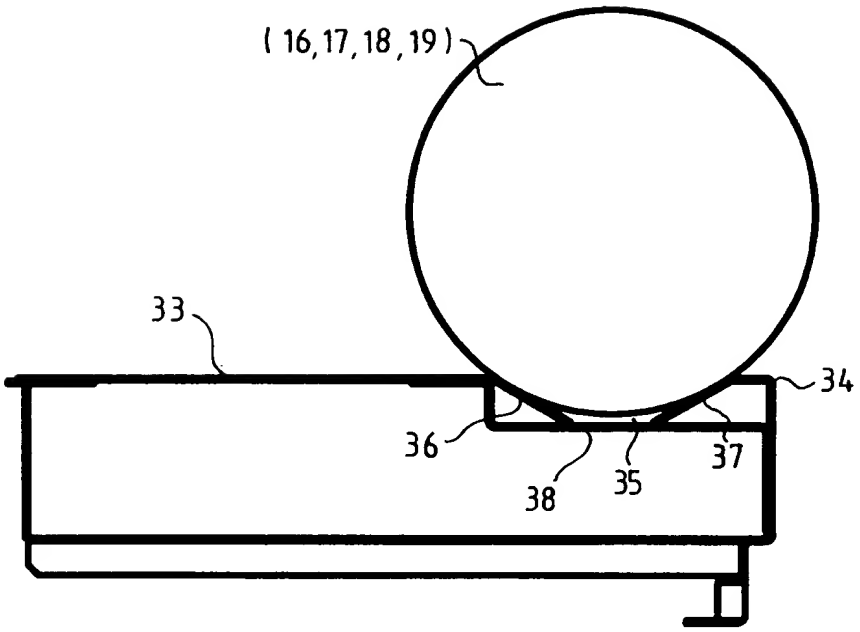

Fig. 2

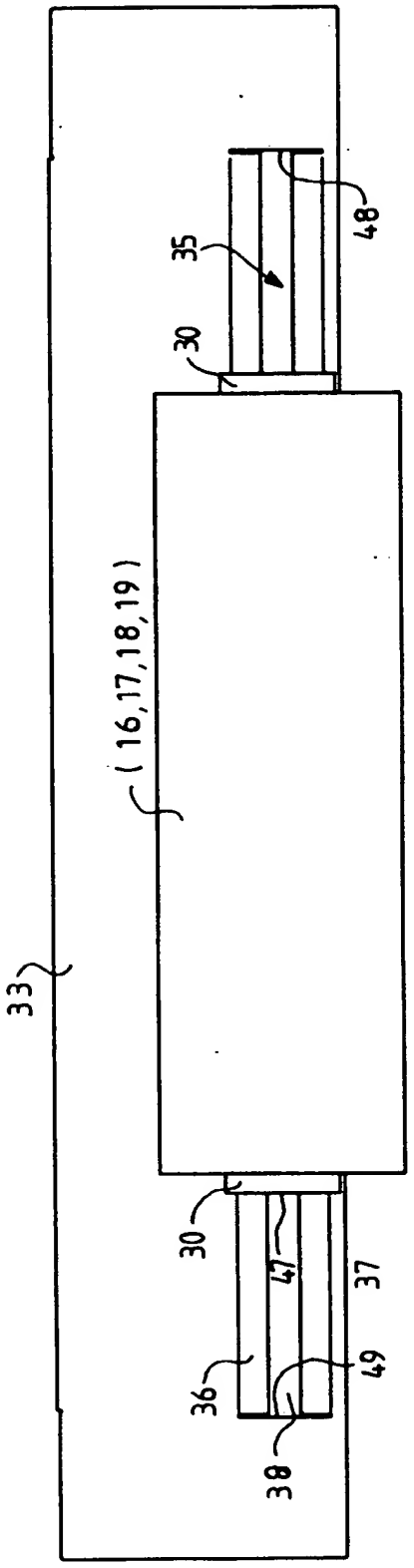

Fig. 3

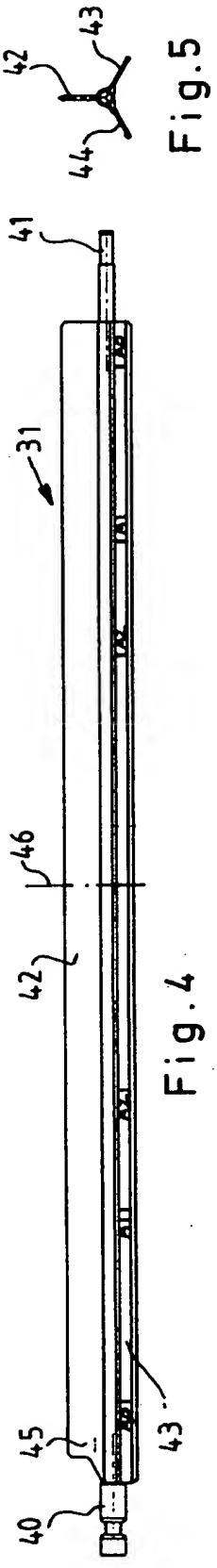

Fig. 4

Fig. 5

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EUROPEAN SEARCH REPORT

Application Number
EP 96 20 0285

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A,D	US-A-5 244 163 (T. MATSUO ET AL.) 14 September 1993 * abstract; figure 6 *	1	B65H19/12 G03G15/00 F16M13/00
A	DE-A-37 21 356 (H. LANGMANN) 12 January 1989 * figure 4 *	1,3	
A	US-A-4 557 029 (R.M. STEWARD) 10 December 1985 * figure 1 *	1,2	
A	EP-A-0 597 168 (LAGER + FÖRDERTECHNIK FALKENSTEIN KG) 18 May 1994 * figure 2 *	1,2	
A	US-A-5 029 376 (K.J. SHARP, JR.) 9 July 1991		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

B65H
G03G
B23P
F16M

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	7 June 1996	Häusler, F.U.

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